Noise Reduction Coefficient (NRC)

While STC and SRC indicate how well noise passes through different materials, NRC (Noise Reduction Coefficient) measures how well materials stop sound from reflecting (how much sound they can absorb). The NRC is the percentage of sound that a surface absorbs (in other words, hits a surface and doesn't reflect back again into the room). So a carpet on rubber underlay could easily have an NRC of about 0.4 (it absorbs 40 percent of the sound hitting it and 60 percent bounces back), while a glass window might score only about 0.05 (it reflects 95 percent of the sound hitting it straight back again).

NRC percentage value (0>>1) average of RC → 250,500,1000,2000 Hz frequencies

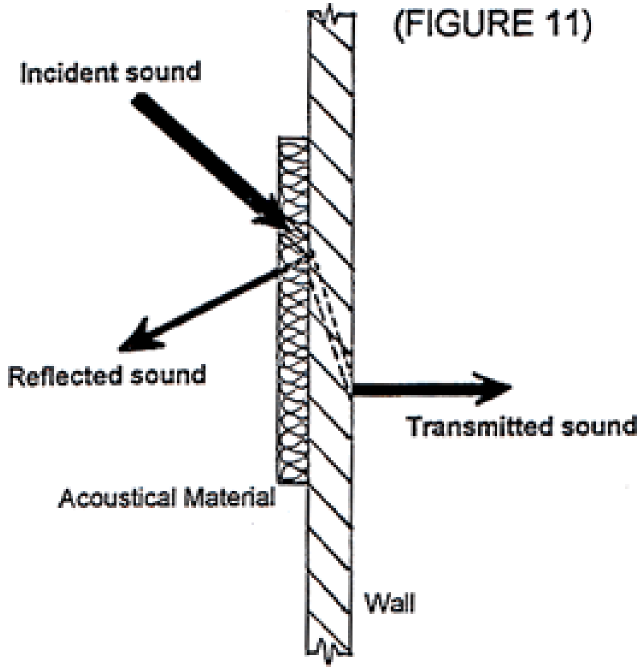
SOUND ABSORPTION

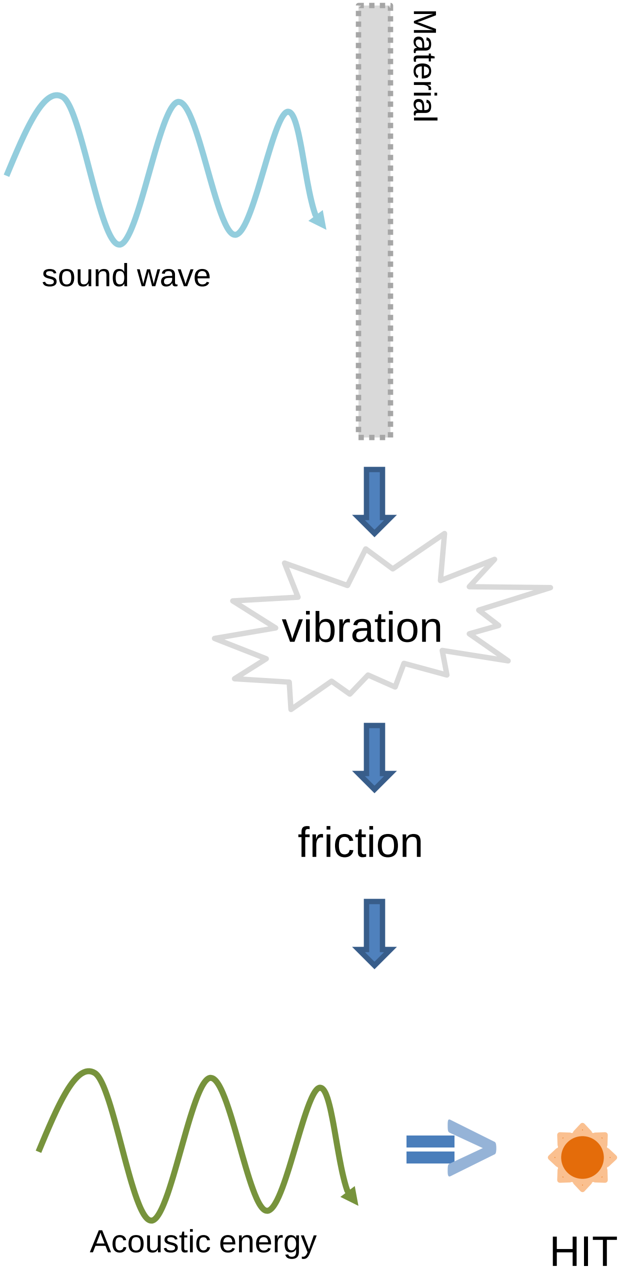
All building materials have some acoustical properties in that they will all absorb, reflect or transmit sound striking them. Conventionally speaking, acoustical materials are those materials designed and used for the purpose of absorbing sound that might otherwise be reflected.

When a sound wave strikes an acoustical material the sound wave causes the fibers or particle makeup of the absorbing material to vibrate. This vibration causes tiny amounts of heat due to the friction and thus sound absorption is accomplished by way of energy to heat conversion. The more fibrous a material is the better the absorption; conversely denser materials are less absorptive. The sound absorbing characteristics of acoustical materials vary significantly with frequency. In general low frequency sounds are very difficult to absorb because of their long wavelength. On the other hand, we are less susceptible to low frequency sounds, which can be to our benefit in many cases.

For the vast majority of conventional acoustical materials, the material thickness has the greatest impact on the material's sound absorbing qualities. While the inherent composition of the acoustical material determines the material's acoustical performance, other factors can be brought to bear to improve or influence the acoustical performance. Incorporating an air space behind an acoustical ceiling or wall panel often serves to improve low frequency performance.

(FIGURE 11)





Better sound absorption

Noise Reduction Coefficients (NRC) for Common Building Materials:

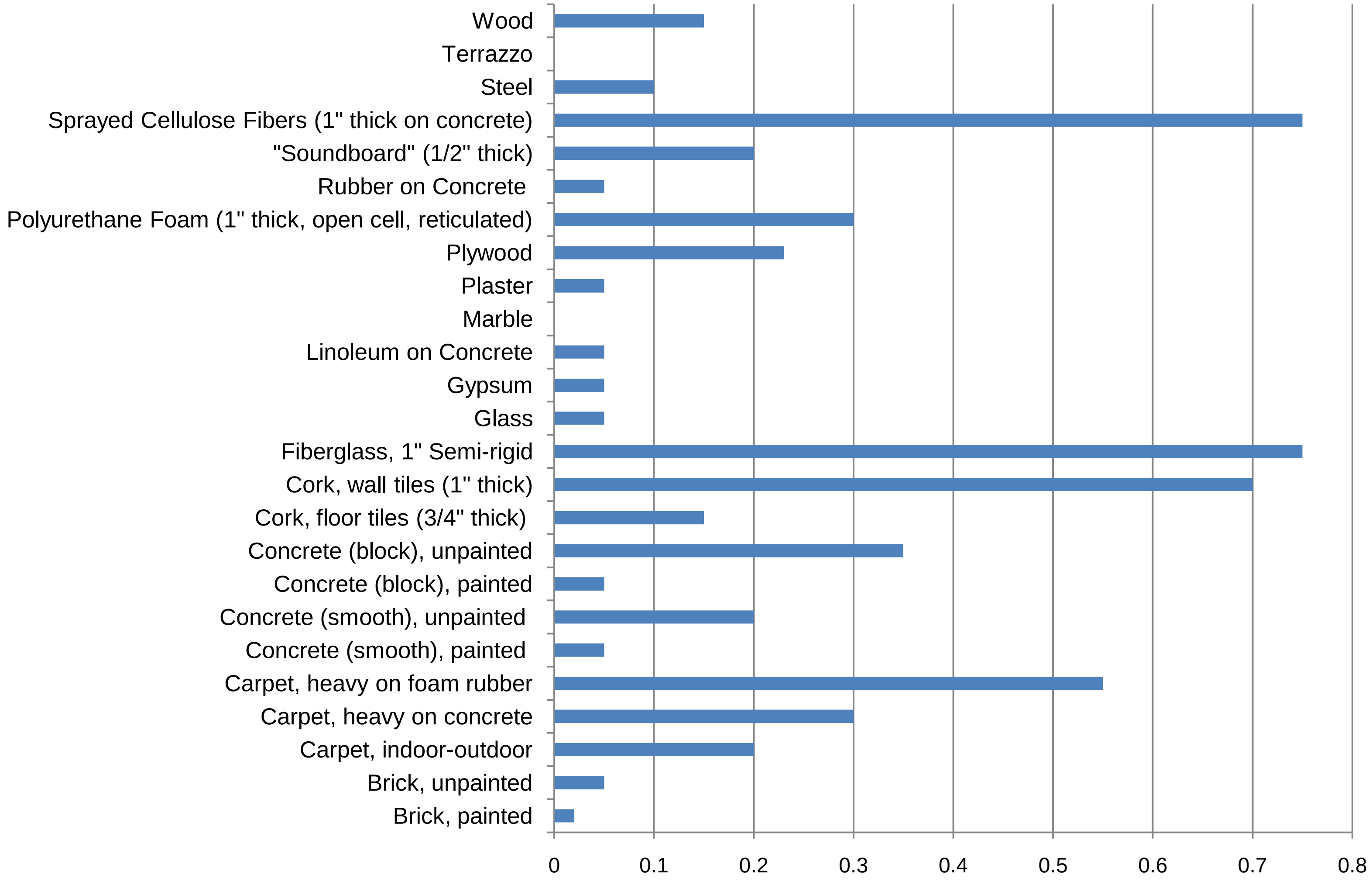
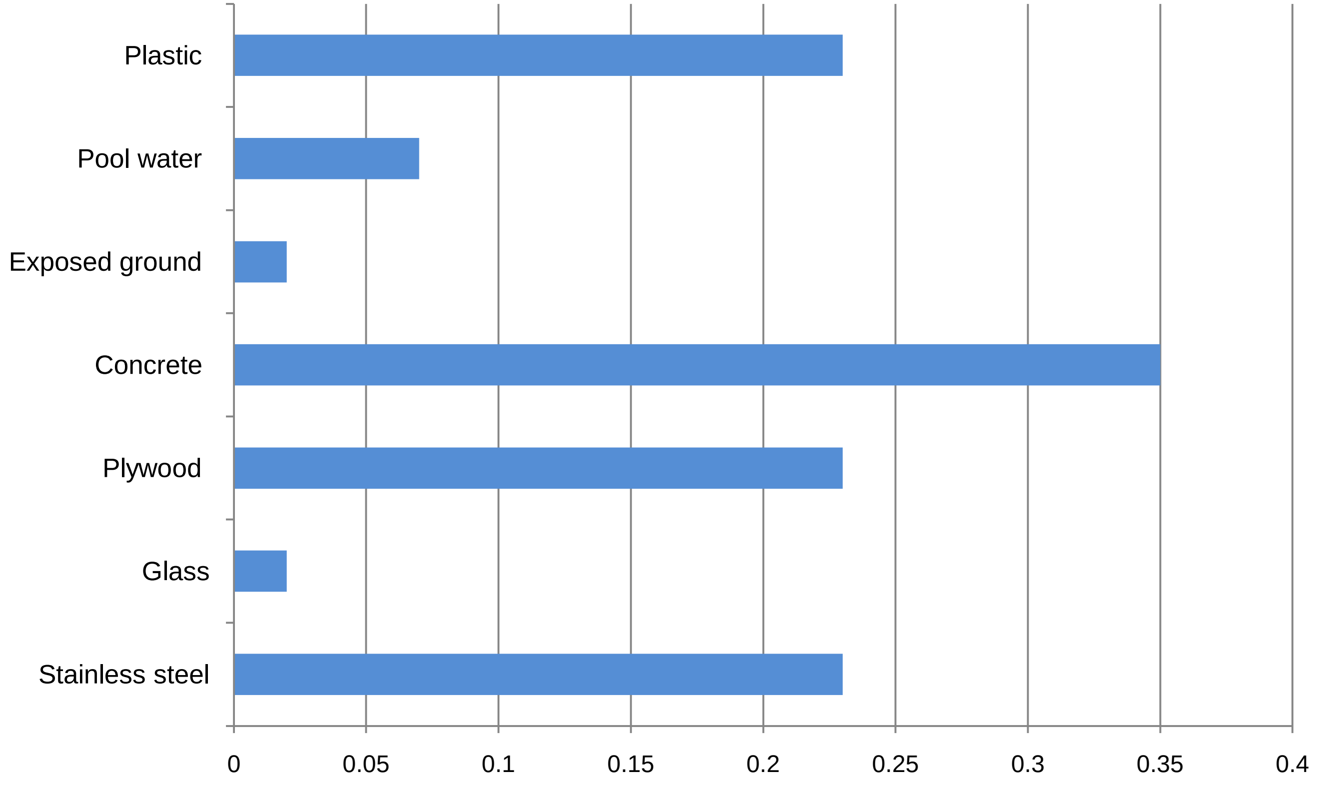


Table of NRC values of most useful materials for noise barriers:

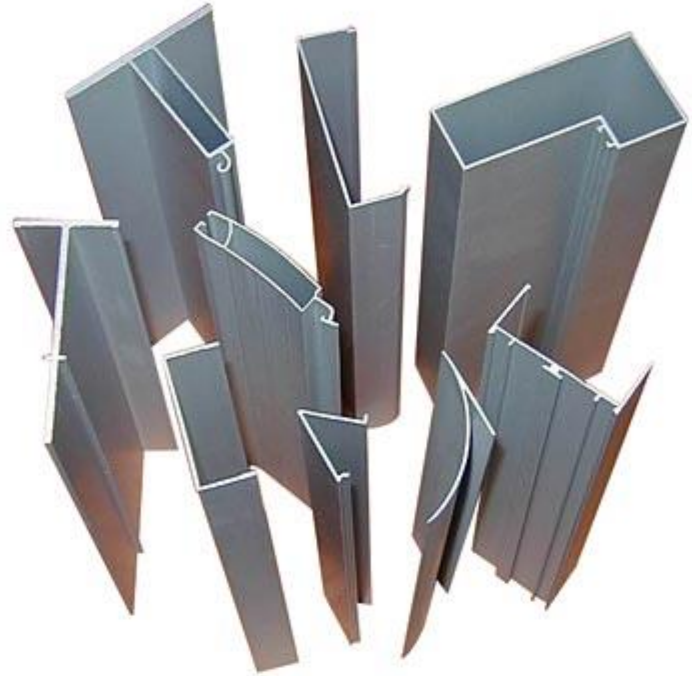
	frequency				
	250 Hz	500 Hz	1000 Hz	2000 Hz	NRC
Stainless steel [1.5mm]	0.34	0.25	0.19	0.15	0.23
Glass [6mm]	0.02	0.01	0.01	0.02	0.02
Plywood [10mm]	0.34	0.25	0.19	0.15	0.23
Concrete [150mm]	0.3	0.4	0.6	0.09	0.35
Exposed ground [1500mm]	0.01	0.01	0.02	0.03	0.02
Pool water [1500mm]	0.04	0.06	0.09	0.09	0.07
Plastic [3mm]	0.34	0.25	0.19	0.15	0.23

NRC values diagram:

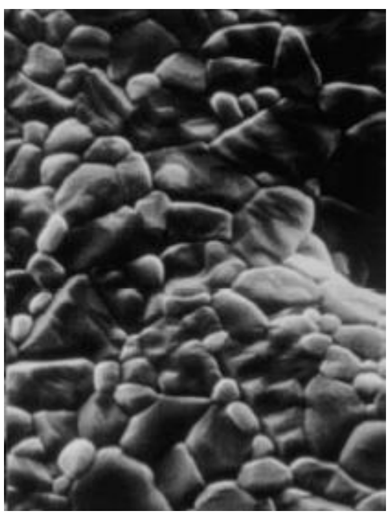


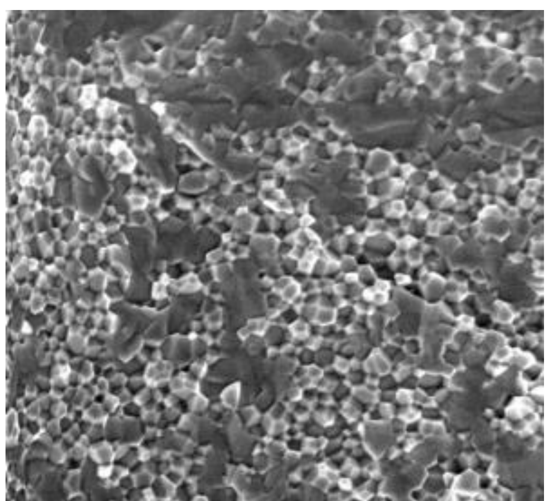
ALUMINUM

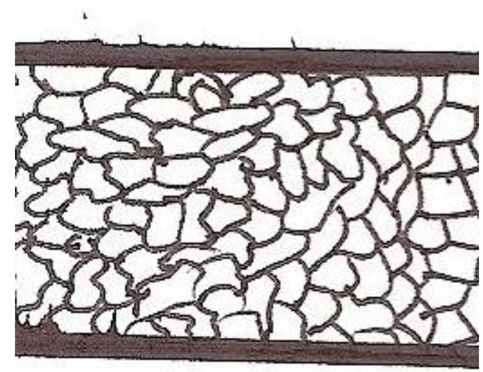
NRC value = 0.05
Reflects 95 % of sound



Aluminum microscopic view:

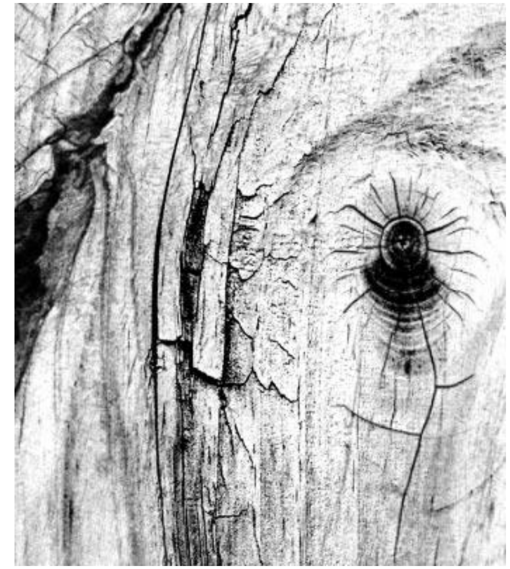




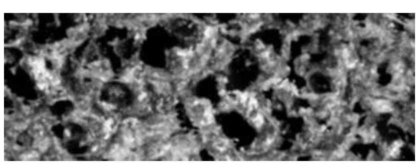


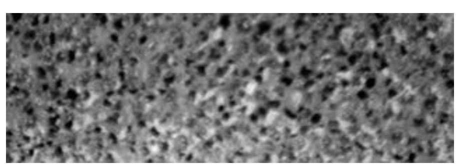
WOOD

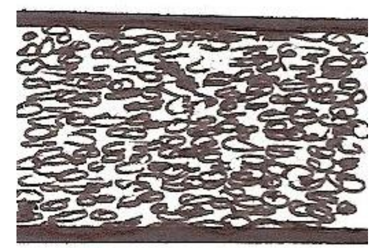
NRC value = 0.2 – 0.5
Reflect 80% - 50% of sound depends on the wood and on fiber direction

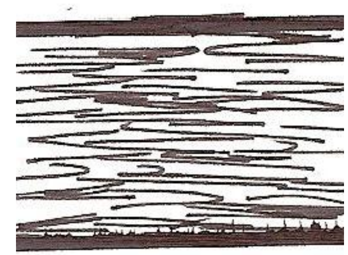


Wood fibers microscopic view:



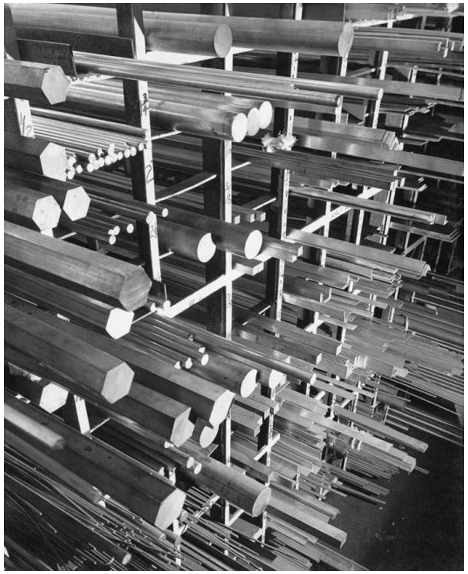




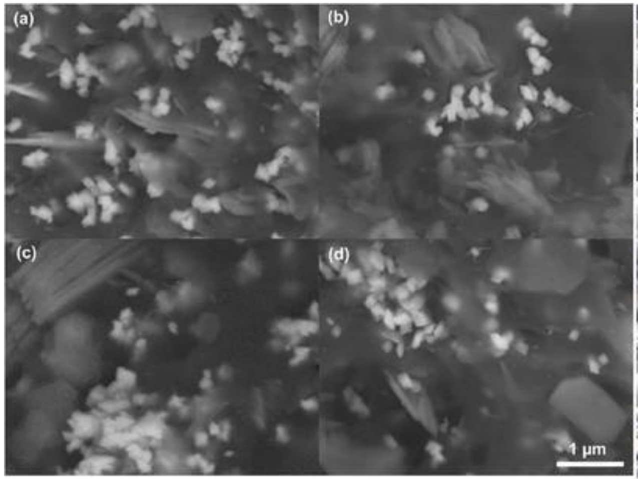


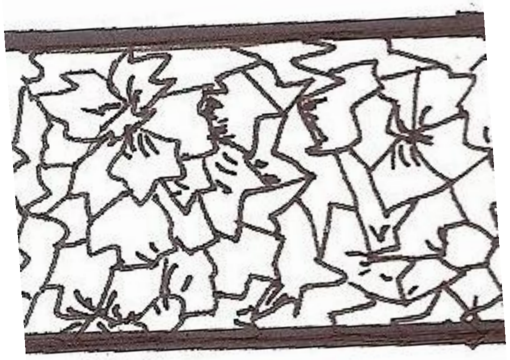
STEEL

NRC value = 0.1
Reflects 90% of the sound



Steel microscopic view:

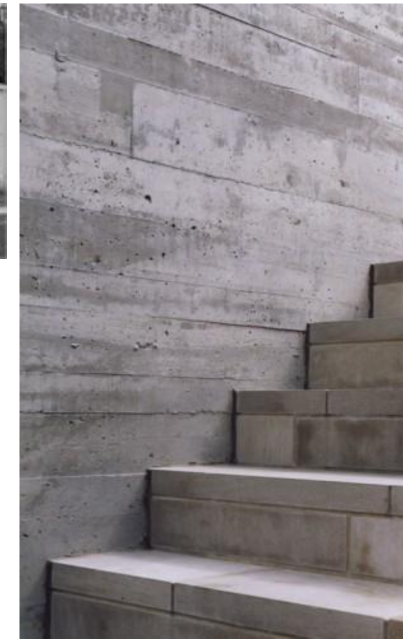




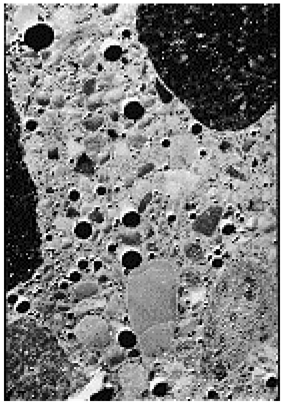
CONCRETE

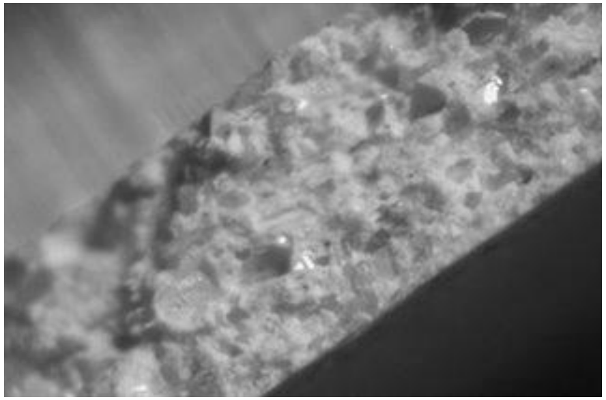
NRC value = 0.35 – 0.7

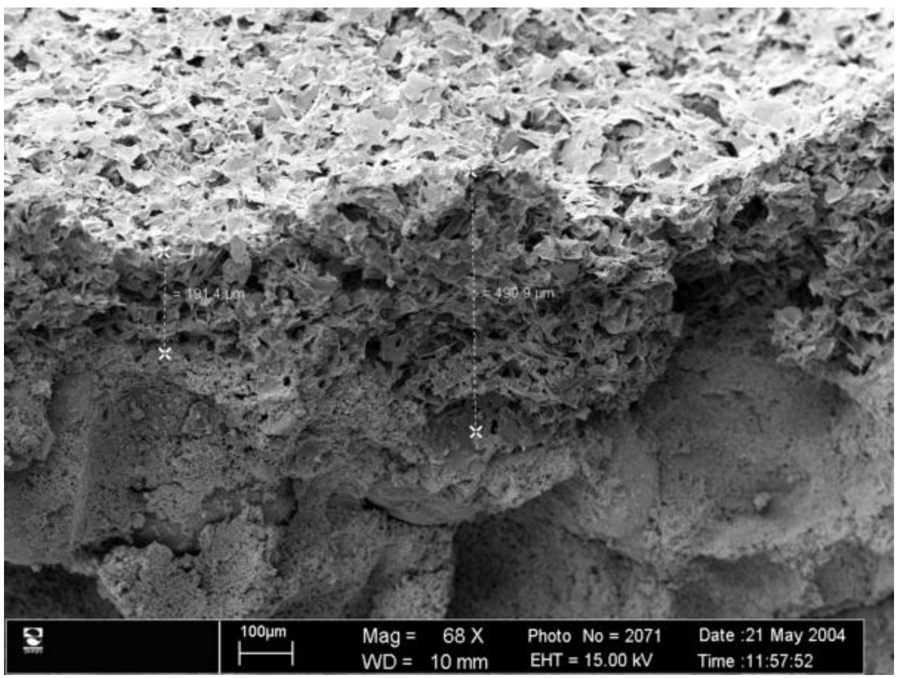
Reflects 65% - 30% of the sound depends on roughness

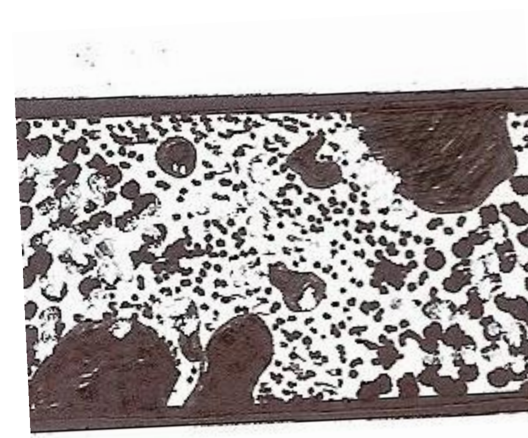


Concrete microscopic view:



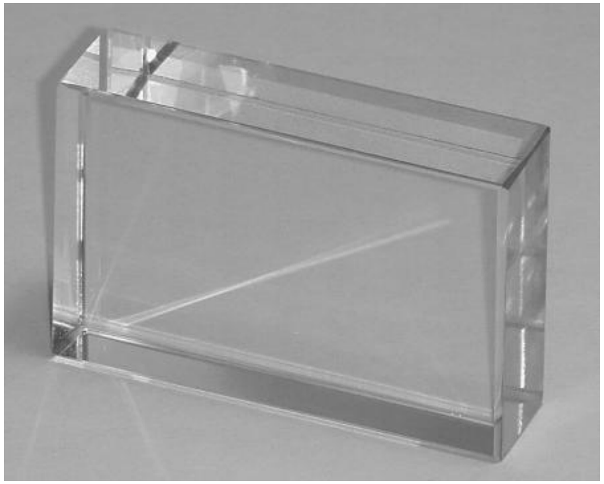






GLASS

NRC value = 0.02
Reflects 98% of the sound



When most people look at a window, they see solid panes of glass. But for decades, physicists, who view window glass at the molecular level, have pondered the question of whether or not glass is a solid or merely an extremely slow-moving liquid.

Glass microscopic view: